

RIVERS AND FLOODS, FEBRUARY, 1912.

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The high waters that occurred during the month of February were mostly confined to the same districts in which floods prevailed during the preceding month, namely, the South Atlantic and east Gulf States. They were in a measure due to the fact that the streams had not yet fallen to the normal stage from the previous floods, and, when the heavy rains that occurred over the watersheds, averaging from 4 to 6 inches for the month, were added, the rivers quickly rose to overflow stages. Considerable flooding, though of short duration, also occurred in the Ohio Valley, as a result of ice gorges; with the breaking of the gorges, however, the water as rapidly fell, and, with the exception of that in the Youghiogheny River, the damage caused by these floods was not so great as that caused by the floods resulting from direct run-off.

In California and the Southwest there was a marked deficiency in the precipitation for the month, the amounts averaging from 1 to 2 inches or more below the normal. It was reported to have been one of the driest months for the season in those sections since the beginning of observations by the Weather Bureau. As a result of this deficiency in precipitation and the deficiency in the amount of water in the rivers during January, all the streams averaged much below their normal stages.

A brief account of the high waters in the various rivers affected follows:

The floods in the Pedee River and its tributaries were among those of greatest extent in the rivers of the Southern States. Heavy rains over the watersheds on February 14 and 15 were the basis for the issue of flood warnings for Lynch Creek and the Pedee River, and they were further supplemented by warnings, including those for Black River, on February 21, as a result of continued moderate to heavy rains at intervals up to the morning of the 22d. The highest stage reached at Effingham, S. C., on Lynch Creek, was 16.5 feet, 4.5 feet above the flood stage, at 3 p. m., February 21. The river was above the flood stage of 12 feet from February 18 to the close of the month, with the exception of a few hours on February 20. At Kingstree, S. C., on Black River, the crest stage was 11.2 feet, 0.8 foot below the flood stage, at 3 p. m., February 21, and in the Pedee River the highest stages during the flood period were 33.7 feet, 6.7 feet above flood stage, at Cheraw, S. C., on February 17, and 14.3 feet, 1.7 feet below the flood stage, at Smiths Mills, S. C., on February 25 and 26. The subsequent fall in the lower reaches of the Pedee River was very slow. The warnings issued by the Weather Bureau resulted in the saving of property along these rivers to the estimated value of about \$25,000. Stockmen and lumber interests were the chief beneficiaries. The losses sustained as a result of the flood were comparatively small, those caused by the enforced suspension of business probably being the greatest, at an estimate of about \$5,000.

Flood stages were exceeded generally in the Santee River and some of its principal tributaries shortly after the middle of the month, but warnings were so thoroughly disseminated, and issued so far in advance of the crests, that there was very little loss of property that could be

protected. The losses resulting from the floods were very small when compared with the value of property saved and protected through considerate use of the warnings. The following crest stages with their dates of occurrence were recorded: Catawba, S. C., on the Catawba River, 12.9 feet on February 16; flood stage, 11 feet. Camden, S. C., on the Wateree River, 31.3 feet at 4 p. m., February 16; flood stage, 24 feet. Blairs, S. C., on the Broad River, 15.7 feet on February 16; flood stage, 14 feet. Pelzer, S. C., on the Saluda River, 7 feet on February 15; flood stage, 7 feet. Chappels, S. C., on the Saluda River, 18.4 feet on February 16; flood stage, 14 feet. Columbia, S. C., on the Congaree River, 20.9 feet at 2 p. m., February 16; flood stage, 15 feet. Rimini, S. C., on the Santee River, 20 feet on February 20; flood stage, 12 feet. Ferguson, S. C., on the Santee River, 15.2 feet at 6 p. m., February 20; flood stage, 12 feet.

A flood was in progress in the lower reaches of the Roanoke River at the close of February, an account of which will be included in the river and flood report for the following month.

The heavy rains that accompanied the storms which swept over the Southern States on February 15 and 21 caused a considerable rise in the rivers of the Altamaha system, but flood stages were not reached except at Abbeville, Ga., on the lower Ocmulgee River, where the flood stage of 11 feet was passed on February 22, and the stage on February 29 was 13.1 feet. Advisory warnings were issued on February 17 and 24, but the rivers did not go as high as expected. The damage caused by the high water was of little consequence.

The floods that were in progress in the rivers of the Mobile system at the close of January gradually receded, and none of the rivers was above the flood stage during the first part of February except the Alabama, Black Warrior, and lower Tombigbee. Crest stages were considerably in excess of the flood stage at several points, among the highest being Milstead, Ala., on the Tallapoosa River, 46.8 feet, 11.8 feet above the flood stage on January 30; Montgomery, Ala., on the Alabama River, 39.4 feet, 4.4 feet above the flood stage at 6 p. m., February 1; Selma, Ala., on the Alabama River, 42.5 feet, 7.5 feet above the flood stage, on February 3; Tuscaloosa, Ala., on Black Warrior River, 46.6 feet, 3.6 feet above the flood stage, at 6 p. m., January 30; and Demopolis, Ala., on the Tombigbee River, 40.1 feet, 5.1 feet above the flood stage on February 4. The stage at Milstead, Ala., was the highest of record since the establishment of a river station at that place. Warnings were issued several days in advance of the crest of the flood, and although the rises were very sudden, that at Tuscaloosa, Ala., on the Black Warrior being 20.7 feet in 24 hours, and at Milstead, Ala., on the Tallapoosa River 27.8 feet in 24 hours, the losses occasioned by the floods were comparatively light. Precautions were taken to protect live stock and other movable property, and in several instances the high waters were beneficial, as lumbermen were enabled to float a great number of logs to the mills. Another flood had begun in the Tombigbee River at the close of the month.

A marked rise occurred in the Chickasawhay and Pearl Rivers during the latter half of the month, as a result of heavy rains on February 20 and 21. Flood stages were slightly exceeded, but no damage resulted.

Heavy rains over Texas on February 23 caused sharp rises in some of the streams in that section, but none overflowed except the Guadalupe. The flood stage of 22 feet at Gonzales, Tex., was exceeded by 2.5 feet on February 25, and that of 16 feet at Victoria, Tex., was exceeded by 3.9 feet on February 28. Advisory warnings were issued on the evening of February 23 and again on the morning of the 24th, but no immediate danger was anticipated. As the water overflowed only in very low places, no material losses occurred.

A flood threatened in the lower Cumberland River during the last few days of the month, and warnings were accordingly issued. Flood stages were not reached, however, and no damage resulted.

Had it not been for the low stage of the Susquehanna River considerable flooding would have occurred along that stream, due to numerous ice gorges. As it was, however, the gorges generally broke and the ice moved out before much damage was done. Conditions were watched carefully and advisory warnings issued whenever necessary.

The floods in the Kiskiminetas and Youghiogheny Rivers, caused from the gorging of ice, assumed serious proportions, and flood stages were exceeded generally. The ice began to move out of the Kiskiminetas on February 26 and out of the Youghiogheny on the 27th. Warnings of the impending danger were thoroughly disseminated, and very little property that could be moved or protected was lost. The crest stage of 30.6 feet, 7.6 feet above the flood stage, at West Newton, Pa., on the Youghiogheny, on February 27, was the highest of record at that place. The overflow was from 2 to 10 feet deep in West Newton, and small towns along the river suffered heavily, not only from flooding but also from destruction caused by the great masses of rapidly moving ice. The crest stage at Saltsburg, Pa., on the Kiskiminetas, was 16.5 feet, 10.5 feet above the flood stage, at 1.30 a. m., February 27. A considerable rise also occurred in the Allegheny and upper Monongahela Rivers, but the damage was not great. The total estimated money value of losses caused by the floods was \$220,000, mostly in the Youghiogheny Valley; the value of property saved and protected by judicious use of the warnings is estimated at \$200,000.

Following the comparatively mild weather that prevailed from February 16 to 19, and the rain which began on the 19th, warnings were issued to points along all the rivers in the Columbus, Ohio, district, except the Maumee, advising that conditions were favorable for the formation of ice gorges and their attendant high waters. The impending floods were checked for a short time by the cold weather on February 21 and 22, but with the rising temperature, melting of snow, and the general rains about February 24 to 27, the warnings were supplemented by advices to prepare for high stages and consequent flooding of lowlands. Flood stages were slightly exceeded along several of the streams from February 27 to 29, but the losses were comparatively small, while considerable property was saved as a result of timely warnings.

As a result of the moderately heavy rainfalls on February 26, combined with the melting of a large amount of accumulated snow, the Wabash River and its tributaries began to rise, and had it not been for the freezing weather that shortly followed the storm of the 26th, thus check-

ing the run-off, floods of serious proportions would have occurred. Before the approach of the cold weather, however, enough water had reached the rivers to cause them to rise to above flood stages at nearly all stations by the end of the month. The damage was not extensive, however, as the flooding was only for brief periods in most cases. Highest stages during the month were reported as follows: Anderson, Ind., on West Fork of White River, 14.2 feet at 6 p. m., February 27; flood stage 9 feet. Indianapolis, Ind., on West Fork of White River, 13.8 feet at 11.30 p. m., February 27; flood stage 12 feet. Elliston, Ind., on West Fork of White River, 23.3 feet on February 29; flood stage 21 feet. Bluffton, Ind., on the Wabash River, 12.4 feet on February 29; flood stage 12 feet. Logansport, Ind., on the Wabash River, approximately 18 feet on February 28; flood stage 12 feet. Attica, Ind., on the Wabash River, 19.2 feet on February 29; flood stage 12 feet. Mount Carmel, Ill., on the Wabash River, 18.4 feet at noon, February 27; flood stage 15 feet. The crest of the flood had not yet arrived in the lower reaches of the Wabash River at the end of the month.

ICE.

The cold weather of the first half of the month caused a further increase in the thickness of the ice in many of the rivers, but the milder weather of the last two weeks caused considerable melting, and by the end of the month the ice had moved out of nearly all the rivers of the middle Atlantic States and southern New England.

SNOWFALL.

South Dakota.—The snowfall averaged about 4 inches greater than during January, and with ordinary temperature conditions will melt slowly and afford an ample supply of water for irrigation and other purposes.

Montana.—Deficient precipitation and high temperatures lessened the depth of snow. The supply of snow water will be deficient, but the deficiency will be offset in a measure by the moisture remaining in the ground from the autumn rains of 1911.

Wyoming.—As a whole there was a marked increase in the quantity of snow and an improvement in its character and condition. Conditions over the Green River watershed are not promising, but over the Snake and North Platte watersheds the snowfall was the heaviest in years.

Colorado.—Over the South Platte and Arkansas watersheds the February snowfall was heavier than usual, but on a frozen surface, indicating an average water flow for the season. Over the western and southern sections the snowfall was deficient, and the water flow will depend upon temperature conditions during the next three months.

New Mexico.—Snowfall was light over the western districts, but the fall was rather heavy in the plateau and plains districts to the eastward, although deficient in the high mountains. As a whole prospects of a good water supply continue unfavorable.

Arizona.—Snowfall generally deficient except over the Gila watershed.

Utah.—The snowfall was heavier than during January, and it is thought that a sufficient supply of water is assured.

Nevada.—The average snowfall was one of the lowest on record, and not more than a moderate water supply is probable from the snow now on the ground.

Idaho.—Snowfall lightest in 10 years, with prospects of slow melting and somewhat less than the usual supply of water.

Washington.—There was not much snow left at the lower levels, but that at the higher ones is well packed and crusted, indicating a high water equivalent.

Oregon.—The snowfall was deficient and but little remained below the 4,000-foot level. However, what remains is well packed, and under normal conditions will run off gradually. In most sections of the State the soil is nearly or quite saturated, and sufficient water seems assured.

California.—The snowfall continues to be very light

and unless March snows and rains are ample there will be a marked deficiency in the water supply.

Hydrographs for typical points on several principal rivers are shown on Chart I. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.